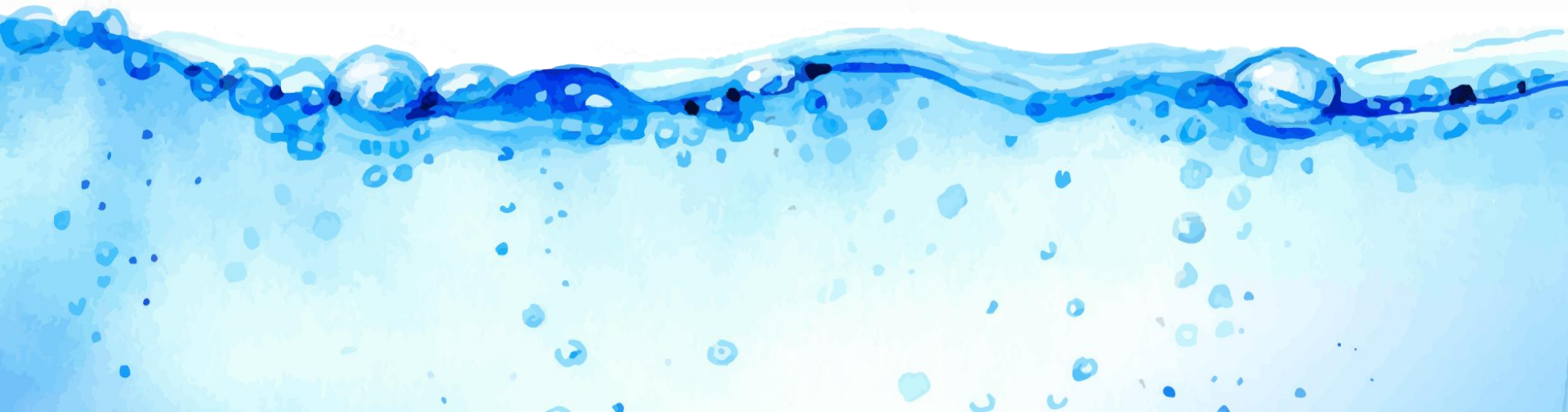




# **An innovative route for recycling agricultural waste**



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I



# Introduction

# Problem

China is a large agricultural country in the world, with a vast area of arable land, accounting for 7% of the world's arable land. Therefore, a large amount of agricultural waste were produced along with agricultural production.

The ecological environment has been seriously affect due to the burning and random stacking and discarding of extensive straw, causing the waste of resources. It is stiiil a problem for industry to improve the treatment of agricultural waste from the source, or even turn the waste into treasure, lending all agricultural products values.

A lot of research has been done on agricultural waste treatment, but there are still problems such as high cost and secondary pollution.

# Problem

```
graph LR; Problem((Problem)) --- B1[1 Serious environmental pollution]; Problem --- B2[2 Excessive agricultural waste]; Problem --- B3[3 Lack a low-carbon environment-friendly and efficient technology for recycling agricultural waste];
```

**1**

**Serious environmental pollution**

**2**

**Excessive agricultural waste**

**3**

**Lack a low-carbon environment-friendly and efficient technology for recycling agricultural waste**

# My purpose

1

**Design a recycling route of agricultural waste with a high utilization**



2

**Lend more value to agricultural waste**



**II**

# **Methodology**

**We designed a new recycling  
technology route**

# Technology Route

Pyrolysis and gasification of **A**

A is for agricultural waste

Raw wood vinegar

Soak **A** with raw wood vinegar

Vacuum distillation

Crude wood vinegar

Wood tar and **A**

Pellet fuels

Soak **A** with crude wood vinegar

Vacuum distillation

Refined wood vinegar

Distillation residue

Deodorizer for composting and livestock manure

Textile dye fixative

Dye color brightener

pH adjuster for dye solutions

Plant growth promoter

Feed additives

Deodorizer

This is a circular technology route.

Pellet fuels





**Results**

# Results

Environment-friendly

1

**Recycle the by-products**

2

**Generate powers by using agricultural waste gasification**

3

**Produce fuels with high energy**

4

**Produce a widely used refined wood vinegar**

(e.g. deodorant, Textile dye fixative, pH adjuster for dye solutions, etc)

## Results

1

### **Recycle the by-products**

The route requires only one material, i.e., agricultural waste, to run the entire production line.

The by-product produced halfway can be put into the previous production line to achieve recycling, thus no waste is produced in the entire route.

2

### **Generate powers by using agricultural waste gasification**

In the first step of the route, we gasify agricultural waste, which not only produces raw wood vinegar, but also provides electricity for subsequent production.

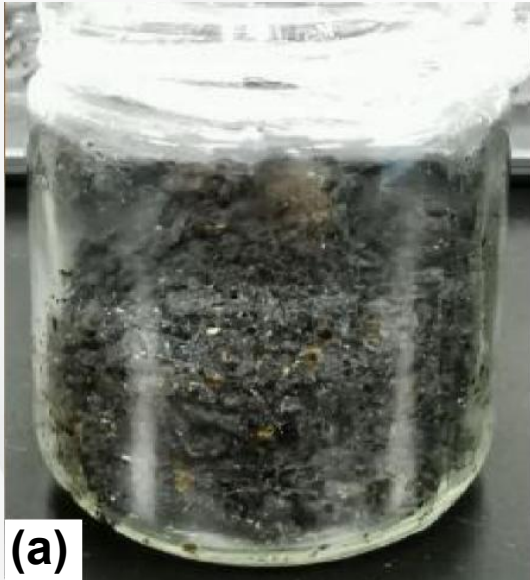
Generating powers by using agricultural waste gasification can not only achieve the recycling of the waste but also realize the effective use of renewable energy.

# Results

3

## Produce fuels with high energy

Compared with the traditional straw pellet fuel, the pellet fuel made of wood tar mixed with straw has the advantages of high hardness and high energy, and is more environmental-friendly.



(a)



(b)



(c)

**Fig. 1.** (a) A creosote straw mixture was produced in this technical route. (b) Pellet fuel produced from a mixture of creosote and straw. (c) Straw directly produced pellet fuel.

## Results

4

# Produce a widely used refined wood vinegar

Wide use:



Textile dye fixative

Dye color brightener

pH adjuster for dye solutions

Plant growth promoter

Feed additives

Deodorizer

**Fig. 2.** A refined wood vinegar produced by twice vacuum distillation.

## Results

4

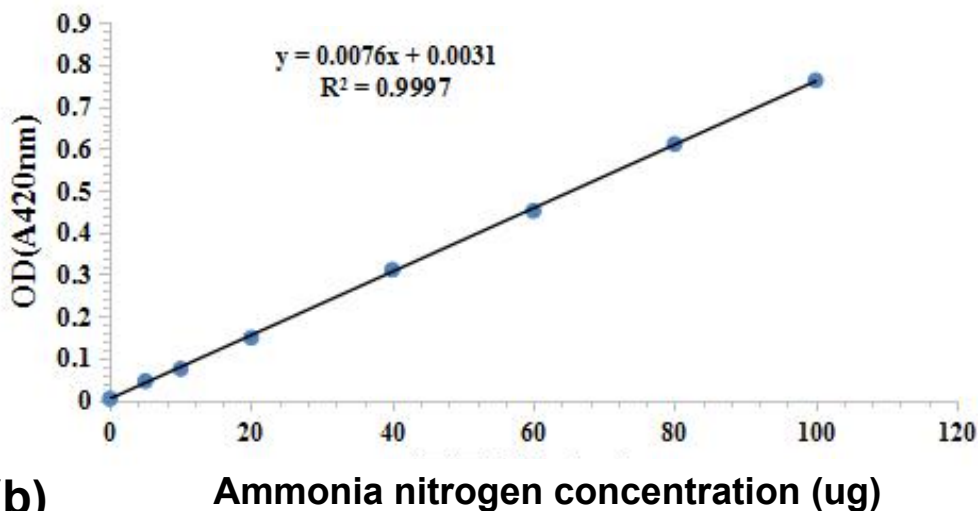
### The deodorization effect of refined wood vinegar was tested

The capacity of refined wood vinegar to removal fetid air was tested by using Nesser's reagent spectrophotometry.



(a)

Nesser's reagent spectrophotometric standard curve



(b)

**Fig. 3.** (a) 10% refined wood vinegar.  
(b) Nesser's reagent spectrophotometric standard curve.



# Results

## 4

### The deodorization effect of refined wood vinegar

**Table 1 the effect of refined wood vinegar in different seasons on removing ammonia nitrogen from fetid air**

<u>group</u> concentration	Control group	Experimental group
Average ammonia nitrogen concentration(mg/L) (August)	876.32 ±13.51	0.32 ±0.03**
Average ammonia nitrogen concentration(mg/L) (November)	518.15 ±12.82	0.01 ±0.00**

**PS: \*\*means P<0.01.The difference between Control group and Experimental group was very significant.**



**IV**



**Conclusion**



## Conclusion

This project has researched and designed a set of technical schemes for the efficient recycling of agricultural waste, so as to realize the comprehensive utilization of agricultural waste resources and reduce environmental pollution.

We have not only produced pellet fuels with high energy, but also created refined wood vinegar which has widely applications by employing this technology.

Our findings solve the problem of harmful waste in the process of wood vinegar refining. From the gasification of agricultural waste to the production of refined wood vinegar, there is no waste residue in the whole process. This route has wide applications in the field of agriculture due to the recycling of by-products and the low production cost.

Thanks for reading

